SEMESTER END EXAMINATION, APRIL-MAY, 2025

Course Name: - B. TECH(ECE) **Semester: - 4TH**

Paper Name: - Analog and Digital Communication **Paper Code: - TEC-401**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. **Max Marks-70**

Additional 30 Minutes for Mid-Test.

समय– 3 घण्टे + 20 मिनट प्रति घंटे अतिरिक्त–दृष्टिबाधित एवं सह लेखक परीक्षार्थियों के लिए। अधिकतम अंक–70

30 मिनट अतिरिक्त मिड–टेस्ट के लिए।

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries **3 mark. All questions are compulsory**.
- Section B- Answer any **5 out of 7** given questions. Each question carries **7 marks**.
- Section C- Answer any **2 out of 3** given questions. Each question carries **10 marks**.
- Section D- Each question carries **02 mark**. All questions are compulsory.

निर्देश:

- प्रश्न पत्र में तीन खण्ड अ, ब, व स हैं। सभी खण्ड अनिवार्य हैं।
- खण्ड–अ में प्रत्येक प्रश्न **तीन अंक** का है। **सभी प्रश्न अनिवार्य हैं।**
- खण्ड–ब में **सात प्रश्नों में से किन्हीं पाँच** प्रश्नों के उत्तर दें। प्रत्येक प्रश्न **सात अंक** का है।
- खण्ड–स में **तीन प्रश्नों में से किन्हीं दो** प्रश्नों के उत्तर दें। प्रत्येक प्रश्न **10 अंक** का है।
- खण्ड–द में प्रत्येक प्रश्न **02** अंक का है। सभी प्रश्न अनिवार्य हैं।

Section – A (खण्ड–अ)

Objective Questions (वस्तुनिष्ठ प्रश्न)

1. Answer all the following questions. **5x3 =15**

निम्नलिखित सभी प्रश्न अनिवार्य हैं।

i) $V(t)=5[Cos(10^6 \pi t) - Sin(10^3 \pi t) \times Sin(10^6 \pi t)]$ represent

a. *Narrow band FM signal*
b. *DSB-SC signal*
c. *AM signal*
d. *SSB upper sideband Signal*

ii) *A modulated signal is given by* $S(t)=m_1(t)Cos(2\pi fc\ t) + m_2(t)\ Sin(2\ \pi fc\ t)$ *where the baseband signal* $m_1(t)$ *and* $m_2(t)$ *have bandwidths of 10KHZ and 15KHZ, respectively. the bandwidth of the modulated signal in kHz.*

a. *10*
b. *30*
c. *25*
d. *15*

iii) The unmodulated carrier power in an Am transmitter in 5KW.this carrier is modulated by a sinusoidal modulating signal. The maximum percentage of modulation is 50%. if it is reduced to 40%, then the maximum unmodulated carrier power (in kw) that can be used without overloading the transmitter.....

a. *3.102kw*
b. *4.571kw*
c. *5.208kw*
d. *6.854kw*

iv) If modulation index of an AM wave is increased from 1.5 to 2, then the transmitted power

a. remains same
b. increases by 20%
c. increases by 30%
d. increases by 40%

v) a signal to quantization noise ratio in an n- bit PCM system
a. increase with increase value of n
b. decrease with the increase value of n
c. is independent value of n
d. dependent upon the sampling frequency employed

Section – B (खण्ड–ब)
Short Answer Questions (लघुउत्तरीय प्रश्न)

2. Answer any five of the following questions. **5x7=35**
निम्नलिखित में से किन्हीं पाँच प्रश्नों के उत्तर दें।

i. Draw the block diagram of communication system and explain the function of each block.
ii. Draw the block diagram of phase discrimination method of generating SSB wave and demodulation of SSB by synchronous detector.
iii. A carrier of $10\cos 8\pi t \times 10^5 t$ is AM signal by a message signal $6\cos\pi\times 10^4 t$, find the all parameter of AM &plot the spectrum
iv. Giving modulated waveforms, single space diagrams and probability of errors draw the optimum receiver structures for DPSK.
v. A Nonlinear device is characteristics by $V_0=V_i+bV_i^2$ where $Vi=m(t)+\cos 2\pi f_1 t$ by considering only DSB signal. the carrier frequency resulting is equal to 1MHZ.
vi. Explain the working of pulse code modulation. explain the quantization error.
vii. Described the delta modulation and deferential delta modulation.

Section – C (खण्ड–स)
Descriptive Questions (विवरणात्मक प्रश्न)

3. Answer any two of the following question. **2x10=20**
निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर दें।

i) With a neat block diagram and necessary equations explain coherent detection of DSBSC wave. Also find advantage and disadvantage of DSBSC signal.

ii) A carrier signal of $Ac\cos 2\pi fc\, t$ is DSB modulated by a message signal of $m(t)=Am1\cos 2\pi fm1\, t + Am2\cos 2\pi fm2\, t$. Plot the resulting spectrum and find the all parameter. $(fm2 > fm1)$ $(Am2 > Am1)$

iii) Explain the FSK and PSK? How is FSK and PSK generated? Obtain the expression for its bandwidth. Briefly discuss regarding its frequency spectrum.

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Mid-Test

Course Name: -B. TECH (ECE) **Semester: -4TH**
Paper Name: -Analog & Digital communication **Paper Code: -TEC-401**
Time - 30 minutes. **Max Marks-20**

All questions are compulsory.
सभी प्रश्न अनिवार्य हैं। **2×10=20**

Objective Questions.
बहुविकल्पीय प्रश्न।

1. The number of bits in binary PCM system is increased from n to n+1. As the result thr signal is quantization noise ratio will improved by a factor-
   a. Which is independent of n
   b. N+1/n
   c. $2^{(n+1)/n}$
   d. $2^{2(n+1)/n}$
2. The line code that has dc component for pulse transmission of random binary data is-
   a. Non return to zero
   b. Alternate mark inversion
   c. Return to zero
   d. None of the above
3. Quadrature multiplexing is
   a. The same as FDM
   b. The same as TDM
   c. Quit difference from FDM and TDM
   d. A combination of FDM and TDM
4. The nyquist sampling frequency in hz of signal given by $6 \times 10^4 \sin c^3(400t) * 10^6 \sin c^3(100t)$ is
   a. 200
   b. 150
   c. 1000
   d. 300
5. In the output of delta modulation speech encoder, the consecutive pulses are of opposite polarity during time interval $t_1 > t > t_2$ this indicate that the during this interval
   a. The input modulator is essentially constant
   b. The modulator is going to slop overload
   c. The accumulator is saturation
   d. The speech signal is being sampled at the nyquist rate
6. A 200w carrier is modulated to depth of 75 percent. the total power of modulated wave is given
   a. 128W
   b. 256.25W
   c. 156.3W
   d. 288.3W

7. When E1 E2 E3 and E4 are the simultaneous modulating voltage then the total modulating voltage will be
   a. $E_1+E_2+E_3+E_4$
   b. $E_1+E_2+E_3+E_4/4$
   c. $\sqrt{E^2_1+E^2_2+E^2_3+E^2_4}$
   d. $\sqrt[4]{E_1E_2+E_3E_4}$
8. A carrier wave has an amplitude of 10 V. After modulation, the maximum amplitude becomes 12 V and minimum is 8 V. What is the modulation index?
   a. 1.0
   b. 0.4
   c. 0.6
   d. 0.5
9. A 1 kHz tone frequency is used to modulate an FM transmitter with a frequency deviation of 5 kHz. Using Carson's rule, what is the bandwidth of the FM signal?
   a. 12K
   b. 8K
   c. 4K
   d. 2K
10. Which component in a receiver selects the desired frequency band?
   a. Mixer
   b. RF Tuner
   c. Local Oscillator
   d. Detector